Institute of Chemical Engineering

Comparison of CO2 Separation Efficiency from Flue Gases Based on Commonly Used Methods and Materials

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The comparison study of CO2 removal efficiency from flue gases at low pressures and temperatures is presented, based on commonly used methods and materials. Our own experimental results were compared and analyzed for different methods of CO2 removal from flue gases: absorption in a packed column, adsorption in a packed column and membrane separation on polymeric and ceramic membranes, as well as on the developed supported ionic liquid membranes (SILMs). The efficiency and competitiveness comparison of the investigated methods showed that SILMs obtained by coating of the polydimethylsiloxane (PDMS) membrane with 1-ethyl-3-methylimidazolium acetate ([Emim][Ac]) exhibit a high ideal CO2/N2 selectivity of 152, permeability of 2400 barrer and long term stability. Inexpensive and selective SILMs were prepared applying commercial membranes. Under similar experimental conditions, the absorption in aqueous Monoethanolamine (MEA) solutions is much faster than in ionic liquids (ILs), but gas and liquid flow rates in packed column sprayed with IL are limited due to the much higher viscosity and lower diffusion coefficient of IL. For CO2 adsorption on activated carbons impregnated with amine or IL, only a small improvement in the adsorption properties was achieved. The experimental research was compared with the literature data to find a feasible solution based on commercially available methods and materials.

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